





Operator	Rank	
a*b		
a+b		
a-b		
a.*b		
a.^b		
a./b		
a.\b		
a==b		
a~=b	$\max(R(a),R(b))$	
a <b< td=""></b<>		
a>b .		
a<=b		
a>=b		
a&b		
alb		
a/b		
a\b_		
[a, b]		
[a; b]		
+a		
-a	7/ )	
~a	R(a)	
. <u>a</u> ,		
a.,	D(a)	
c(:) ← a	R(c)	
a b	2	
a(:)	2	
rand a:b		
rand(a, b)	2	
ones(a, b)	2	
a(e)	R(e)	
$\mathtt{a}(e_1,e_2,\ldots,e_n)$	25(0)	
$rand(e_1, e_2, \ldots, e_n)$	n	
ones $(e_1, e_2, \ldots, e_n)$	]	
c(e) ← a	$\max(R(a),R(c))$	
$c(e_1,e_2,\ldots,e_n) \leftarrow a$	$\max(n, R(c))$	

FIG. 4

-MATLAB	Shape	_		
Expression	Expression	$\overline{ heta}(e)$	u ·	
· e				
a+b	s⊕t	$\overline{ heta}(a)\overline{ heta}(b)(1-(1-\overline{lpha}(a)) \ (1-\overline{lpha}(b))(1-\overline{eta}(a)\overline{eta}(b) \ \delta(\Psi s \Psi \Gamma_1 - t \Gamma_1)))$	$(1-\overline{ heta}(e))\pi^*+\overline{ heta}(e)(s^*\overline{lpha}(b)+\ t^*\overline{lpha}(a)(1-\overline{lpha}(b))+(s^*\Gamma_1+\ t^*\Gamma_2+\mathbf{I}-\Gamma_1-\Gamma_2)(1-\overline{lpha}(a))\ (1-\overline{lpha}(b)))$	
a+b a-b a.*b a.*b a./b a.\b a==b a<=b a>>b a>=b a>=b a>=b a>=b	$s \oplus t$	$\overline{ heta}(a)\overline{ heta}(b)(1-(1-\overline{lpha}(a))\ (1-\overline{lpha}(b))(1-\delta(s-t)))$	$egin{aligned} &(1-\overline{ heta}(e))\pi^*+\overline{ heta}(e)(s^*\overline{lpha}(b)+\ &t^*(1-\overline{lpha}(b))) \end{aligned}$	
+a a ~a	įs	$\overline{ heta}(a)$	s*	
a~b	s⊙t	$egin{aligned} & \overline{ heta}(a)\overline{ heta}(b)(1-(1-\overline{lpha}(a)\overline{eta}(b)) \ & \delta(t\Gamma_1-\Psi t\Psi\Gamma_1)) \ & (1-\overline{lpha}(b)\overline{eta}(a)\delta(s\Gamma_1-\Psi s\Psi\Gamma_1))) \end{aligned}$	$(1-\overline{ heta}(e))\pi^*+\overline{ heta}(e) \ (s^*\overline{lpha}(b)+t^*(1-\overline{lpha}(b)))$	
a.,	-8	$\overline{eta}(a)$	$(1-\overline{ heta}(e))\pi^*+\overline{ heta}(e)\Psi s^*\Psi$	
a/b	$s\dot{\phi}t$	$\overline{ heta}(a)\overline{ heta}(b)(1-\overline{lpha}(b))(1-\overline{lpha}(a)) \ (1-\overline{eta}(b)))(1-\overline{eta}(a)\overline{eta}(b)) \ \delta(s\Gamma_2-t\Gamma_2)$	$t^*(1-\beta(b)) + (s^*\Gamma_1 + \mathbf{I} - \Gamma_1 - \Gamma_2 + \Psi t^*\Psi \Gamma_2)(1-\overline{\alpha}(b))\beta(b)$	
<b>a\</b> b	sõt	$ \begin{array}{c c} \overline{\theta}(a)\overline{\theta}(b)(1-\overline{\alpha}(a))(1-\overline{\alpha}(b)) \\ (1-\overline{\beta}(a)))(1-\overline{\beta}(a)\overline{\beta}(b)) \\ \delta(s\Gamma_1-t\Gamma_1) \end{array} $	$(1-\overline{\theta}(e))\pi^* + \overline{\theta}(e)(t^*\overline{\alpha}(a) + s^*(1-\beta(a)) + (\Psi s^*\Psi \Gamma_1 + I - \Gamma_1 - \Gamma_2 + \underline{t}^*\Gamma_2)(1-\overline{\alpha}(a))\beta(a)$	
[a; b]	s⊚t	$\overline{ heta}(a)\overline{ heta}(b)\delta(s(\mathbf{I}-\Gamma_1)-t(\mathbf{I}-\Gamma_1))$	$\frac{(1-\overline{\theta}(e))\pi^*+\overline{\theta}(e)}{(s^*+t^*\Gamma_1)}$	
[a, b]	sėt	$\overline{ heta}(a)\overline{ heta}(b)\delta(s(\mathbf{I}-\Gamma_2)-t(\mathbf{I}-\Gamma_2))$	$(1-\overline{ heta}(e))\pi^*+\overline{ heta}(e) \ (s^*\Gamma_2+t^*)$	

FIG. 5

Shape-Tuple Class Operator	Identity	Associativity	Commutativity	Idempotent Law
●	i	×	×	×
<b>⊕</b>	i	<b>1</b>	•	₹.
}	_	-		•
0	i	1	1	X
	***	-		-
0	X	X	Х	X
٥	×	×	Х	×
0	×	1	✓.	X
0	X	<b>✓</b>	1	X

FIG. 6